Model 2005

Azimuth Positioner

User Manual

Positioner shown with optional SAM head and floor absorber

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An ESCO Technologies Company

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Revision	Description	Date
A	Initial Release	June, 2004
B	Add filter manual as addendum	May, 2006
C	Rotary joint moved from option to standard	June, 2006
D	Revise to current style standards, remove filter addendum, add filter information as a numbered section	March, 2009

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Notes, Cautions, and Warnings

	Note: Denotes helpful information intended to provide tips for better use of the product.
CAUTION	**Caution**: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.
WARNING	**Warning**: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.

See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

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1.0 Introduction

ETS-Lindgren's Azimuth Positioner (AP) is designed to perform two-dimensional measurements (or manual three-dimensional measurements) of spherical antenna patterns. The AP includes a vertical support column that will accommodate EUTs up to 11.33 kg (25 lbs).

The height of the vertical support column must be specified at the time the order is placed as each is built according to the customer's specified height. In order to minimize any potential RF obstruction or distortion of RF signals from low directive wireless transmit antennas, the AP vertical support column is constructed of low dielectric materials.

The AP is equipped with one motor base, 110/220 VAC 50 or 60 Hz single phase IEC receptacle is the standard power requirement. Current draw is less than 3 amps. The motor drive, in conjunction with the provided command set, controls the movement of the unit. Optional EMQuest™ EMQ-1xx drivers are available with the purchase of EMQuest software. In addition, the positioning system is provided with an RS-232 control cable (15 feet long), which enables the I/O signal between the motor base and the computer.

Finally, the system is provided with an RS-232 shield room filter including integrated D sub-miniature connectors. The LMF-3995 RFI/EMI filter is a device used in a wide variety of applications mainly as a means of protecting other equipment from unwanted RFI and EMI. The filter may not protect against voltage transients and current short circuits. Access to terminals for the filter can only be accomplished by the removal of input and output covers. The covers are secured with screws. The filter is provided with male (output) and female (input) DB-9 connectors.

Standard Configuration

- Model 2005 positioner motor base
- LMF-3995 RS-232 RFI/EMI Filter
- Custom vertical support
- Coaxial rotary joint kit

Optional Items

- Phantom head (does not include solution)

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

2.0 Maintenance

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

CAUTION

Disconnect the power before proceeding with recommended maintenance. Do not perform maintenance while the positioner is operating.

Warranty may be void if the housing is opened.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Positioner Maintenance Recommendations

Annual Calibration

See the *Product Information Bulletin* included with your shipment for information on ETS-Lindgren calibration services.

Periodic Maintenance

- Change synthetic oil lubricant in the gear box every 5,000 operating hours or every 12 months, whichever occurs first.

Use only synthetic oil for the Model 2005 position system.

- Inspect drive belt and pulleys periodically for excessive wear.
- Check cables for wear. Ensure they are clear of potential damage from moving parts.
- Periodically inspect the Speed Reducer, located in the gearbox, for any signs of impending service. The following items may indicate need for service:
    - Oil leaking from seals—indicates that shaft and/or seals are worn and need replacing. Keep dirt and foreign particles off shafts in the area of the seals to minimize wear.
    - Oil leaking from input or output caps, cap screws or pipe plugs—might be corrected by tightening or removing and recoating a pipe sealant as required before tightening. If this does not correct the leaking condition, disassembly will be necessary to replace o-rings.
    - Excessive end play of shafts—if there is noticeable shaft movement when couplings are removed and shaft is moved back and forth, it may be an indication of bearing wear. Replacement may be required.
    - Excessive backlash—would indicate worn gears, which may need to be replaced. Excessive backlash is gear play of more than ± 2 degrees.

Screw threads and the threaded hole must be degreased before application of LOCTITE®.

Replacement and Optional Parts

Following are the part numbers for ordering replacement or optional parts for the Model 2005 Azimuth Positioner.

Replacement Parts	
Part Description	**Part Number**
Serial Cable (set of two)	675282 (D89M to D89F, 15 ft.)
Coaxial Rotary Joint Kit	890817
Tabletop Posts (set of three)	108689
Tabletop Absorber (must order all three)	AF323280.20CL AF32380.2 AF323281
Gears	880275
Synthetic Oil	0880056
Mounting Bolts	880299
Cable	RFC-SMS-100-SMS-26 IN
Serial Filter	E-LMF-3995-RS232
User Manual	399284

Optional Parts	
Part Description	**Part Number**
Phantom Head	111606

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

Filter Maintenance Recommendations

Preventative maintenance is not required for power filters.

3.0 LMF 3995-RS232 RFI/EMI Filter

Filter Specifications

Current	4 x 0.006 amps
Voltage	0-30 VAC/VDC
Impedance	5000 ohms (L-L)
Passband	± 1.0 dB 0-120 kHz, 2500 ohms (L-G)
Insertion Loss	100 dB 300 kHz-18 GHz
Overall Dimensions	14” x 3” x 2” (L x W x H)
Approximate Weight	5 lbs
DB-9 Connector Pin Out Input:	Pin 2, Rx Pin 3, Tx Pin 5, GND All others, NC
DB-9 Connector Pin Out Output:	Pin 2, Rx Pin 3, Tx Pin 5, GND All others, NC
Temperature Rating	Ambient range -55º C to +65º C
Dielectric Strength	All power line filters will withstand the dielectric voltage tests in accordance with UL requirements and MIL-F-15733
Overload and Surge Current Capacity	All power line filters will withstand the current overload requirements of MIL-F-15733 and UL-1283

Marking and Documentation

The filter contains an identification label that states manufacturer's name, model of filter and serial number. The label also establishes the frequencies of operation, voltage, current rating and impedance (if applicable). The filter contains necessary labels indicating which terminals are grounded, danger of high voltage and the need for discharging of capacitors.

Filter Testing

The ability to provide the customer with a highly reliable product demands repeatability and controlled processing. We have achieved this objective using testing procedures to verity that filter products conform to original design parameters. Testing is performed in accordance with Military Specifications that include MIL-F-15733, MIL-STD-220A, as well as commercial specification UL-1283. Precision electronic test instruments are utilized to accurately measure the characteristics of each filter. Test reports are available upon request.

Protection Against Electric Shock

Protective earthing is accomplished by means of a screwed on cover that is in contact with the body of the filter. This cover protects against accidental contact with live terminals and also provides a ground path by means of the body of the filter. The filter, when in use, should be permanently grounded by means of grounding connection and also by contact of the filter to the grounded surface to which it is attached. This arrangement provides for very low impedance from the filter body to earth ground.

Safety Precautions

- Ensure power is disconnected from the filter prior to beginning any work.
- After the covers are removed and prior to beginning any work or prior to touching any electrical connector, ensure the filter is discharged by shorting all filter terminals to the filter case with a metallic object that has an insulated handle. Be careful to touch the terminal very softly and not damage the terminal.
- Read and understand all warning labels affixed to the filter.
- Filters are rated for ambient temperature of -55º C to +65º C
- Operate filters in an indoor environment as described by NEMA 2. A degree of protection is provided against contact with the enclosed equipment, falling water or dirt. Do not expose filter to rain or windblown dust.
- The intended use of the filter is a stationary shielded enclosure. Do not mount filters onto mobile enclosures.

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4.0 Pre-Installation Tasks

CAUTION **Before installing any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.**

CAUTION **Ensure power is off and base is secured before proceeding with installation.**

Pre-planning is essential for successful installation. Discuss requirements with your sales representative and request dimensional drawings prior to construction of your site.

Tools Required

- 3/8” open/box end wrench
- 7/16“ open/box end wrench
- 3/16” Allen wrench
- #2 Phillips screwdriver
- Wire cutters
- Pry bar
- Level (i.e. torpedo laser)
- Black marker
- Adjustable wrench
- Drill with 1” bit for filter penetration in shield
- 1/4” hex-head driver to open filter box
- Self tapping screws to mount filter
- Scouring pad suitable for cleaning stainless steel surfaces

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5.0 Assembly and Installation

CAUTION **Before install any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.**

Positioner Installation

Proper installation of the Azimuth Positioner (AP) unit directly affects performance of the positioning system as well as the accuracy of the test results.

1. Uncrate all parts. Check all parts for any shipping damage. Ensure a clear area is available to assemble the AP unit safely.

Do not discard packing material until the AP is fully assembled and correct operation is verified.

The Azimuth Positioner consists of:

- Variable speed turntable
- Three Lexan pegs
- Lossy foam absorber (three pieces) to cover the top of the turntable
- Custom vertical column
- Rotary joint kit including all internal RF cabling

Customer provides RF cabling to the top of the support column.

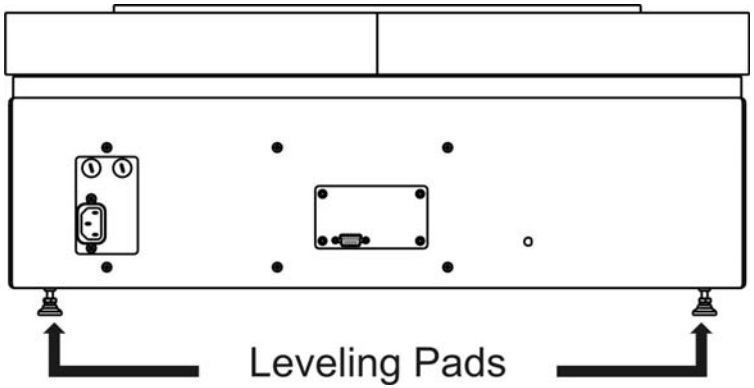
2. The center of rotation for the AP must intersect the line through the bore sight of the measurement antenna. It is recommended that a 5-beam laser level be utilized to verify the alignment and location.

3. Position the AP so that the connections on the turntable are easily accessible and located closest to available feed through panels and power supply connections. Verify that the supplied serial cable, as well as any user supplied RF cable(s), is long enough to reach from the AP unit to the feed through panel that will include the RS232 filter before settling on an orientation.

4. Ensure than any power supply feed or other conduits or connector panels installed on the floor near the AP are located outside the perimeter of the AP motor base. When working around the table, avoid stepping on any cables or their connectors. The cables will be installed in a later step.

5. Use a marker, with the AP in the desired position, to mark around the perimeter of the table base. These marks will be used for reference if the assembly moves.

6. Once the position of the AP has been determined, the table must be leveled. Using a leveling instrument (torpedo laser level or some other device) level the AP by turning the level mount pads on the bottom of the motor base. When the turntable is level, tighten all lock nuts on the leveling pads to lock the height of the AP into place.

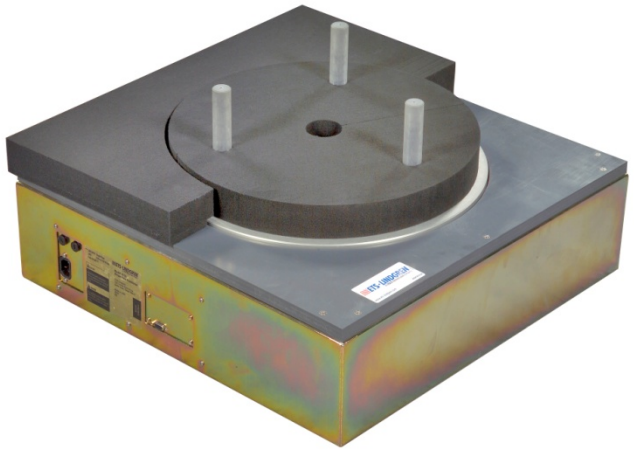


Absorber and Support Column Installation

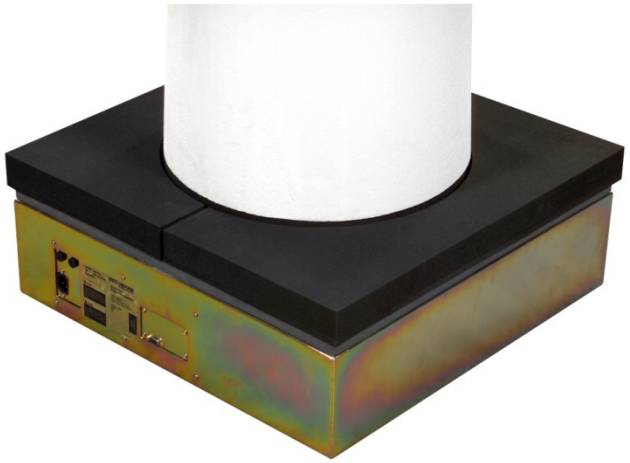
7. Prior to installing the support column, insert the three one-inch diameter mounting pegs into the spaces on top of the motor base.

8. Next, place the center circular absorber piece over the support pegs.

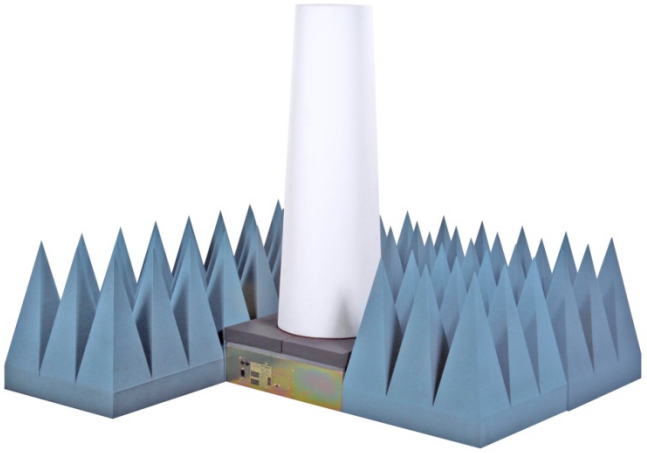
9. Finally, place the remaining two absorber pieces on the outer portion of the motor base



10. Install the vertical support column onto the motor drive mount by placing it over the pegs on top of the motor base.



11. Finally, floor absorber (provided by the customer) may be placed around the motor base to prevent RF interference from the positioner itself.



Electrical Installation

CAUTION **Electrical connection should only be performed by a qualified electrician and subject to location electrical codes.**

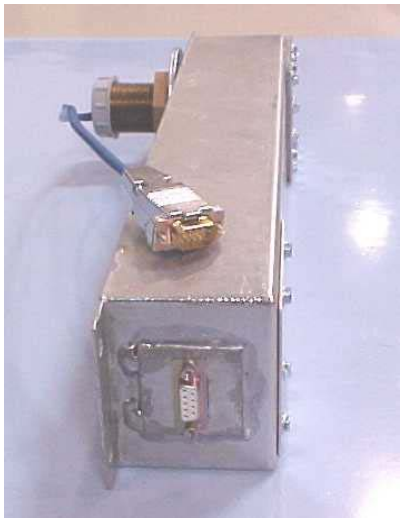
The Model 2005 Azimuth Positioner (AP) is designed to operate using 110/220 VAC single phase 50 or 60 Hz power. The branch circuit supplying power to the motor base must be protected from excess current according to local electrical codes. ETS-Lindgren has provided integral circuit protection in the motor base assembly.

Check that the conductor size is adequate for the motor load and the distance from the mains source is appropriate. Improperly sized conductors will lead to a high voltage drop in the power conductors and cause reduced starting torque and premature motor failure.

CAUTION **Prior to servicing the AP or the turntable motor base, remove the power connection.**

Connect the serial control cable and install the power connection per local electrical code.

Filter Installation



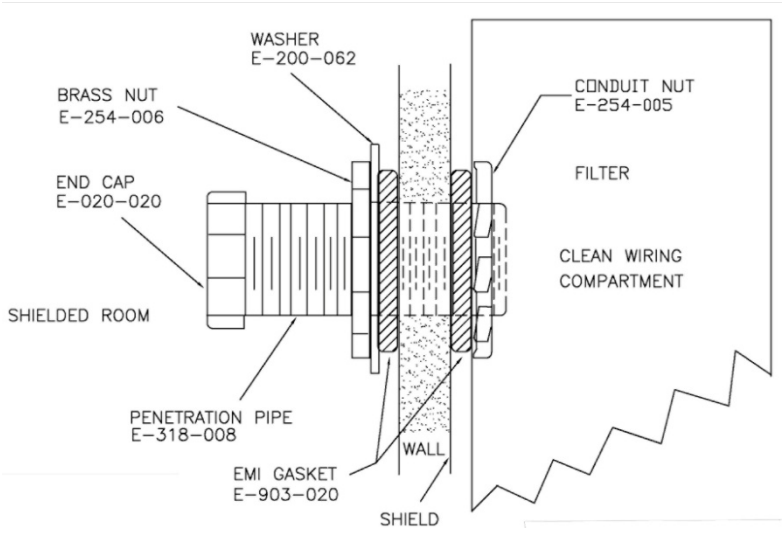
The filter is equipped with a 1 in. inside / 1.3 in. outside diameter (2.5cm inside/3.3cm outside) standard pipe penetration conduit kit. This includes pipe, conduit nut, brass nut, washer, circular EMI gasket and plastic cap. A 1.35 in. (3.429cm) hole must be made in the shield of the room in order to accommodate the conduit penetration of the filter. Drawings are included for reference during installation.

- Open the gasketed compartment of the filter, being careful not to damage the EMI gasket that sits below the cover.
- Remove the plastic cap, brass nut and washer from the conduit penetration on the outside of the filter.
- Clean the shield using a scouring pad (provided by the customer) suitable for cleaning stainless steel surfaces ensuring no glue residue is present.

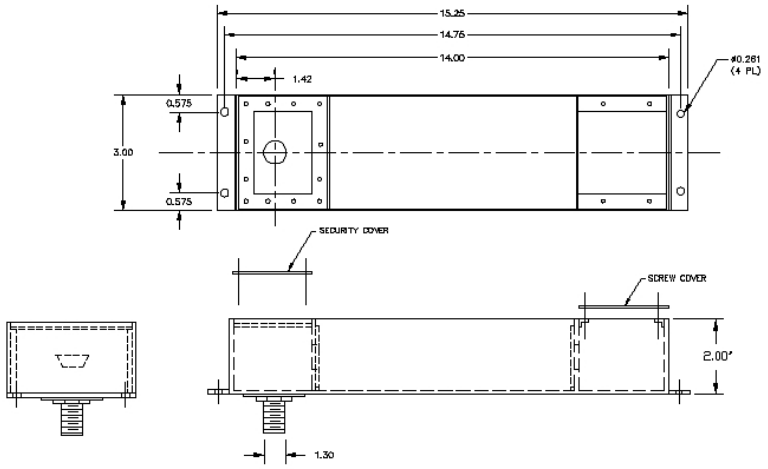
CAUTION

Failure to use an appropriate scouring pad to remove all residue could result in reduction of shielding effectiveness.

- Thread the conduit penetration and DB-9 connector through the hole on the shield, making sure that the circular gasket presses against the shield
- Hold the conduit nut on the inside of the filter in order to have the washer and nut installed from the inside of the shielded room. Two people may be necessary to perform this step.
- Screw the brass nut on the conduit penetration and tighten by hand. Using an adjustable wrench, apply an additional ¼ of a turn clockwise to the brass nut. Do not apply excessive torque to the brass nut.
- Self drilling screws, provided by the customer, may be used to mount the filter to the shielded wall by its mounting holes. Other means include screw and nut by a through hole on the shield. Mounting screws and nuts should be tightened so that there are no gaps between the filter and shield where the screws penetrate the shield. This will insure a proper RF seal.



Filter Penetration Pipe Assembly



Filter dimension outline

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6.0 Operation

CAUTION **Before operating any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.**

See “Verifying Communication with Model 2005 Azimuth Positioner” at www.ets-lindgren.com, 2005 Positioner, Related Links for additional information.

Model 2005 Azimuth Positioner Port Settings

Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Model 2005 Azimuth Positioner Command Set

Command	Format	Example	Description
Set Speed (0-3)	SX (x = 0,1,2,3)	S1	Sets speed for AP: S0 = 0.25 rpm S1 = 0.5 rpm S2 = 1 rpm S3 = 2 rpm
Query Speed	S?		Returns speed setting (0-3)
Continuous Rotation	CR		In the continuous mode of operation the AP is allowed infinite movement. The AP travels from 0 – 359.9 and the limits are ignored
Non-continuous Rotation	NCR		In the non-continuous mode, the AP motion is restricted between the upper and lower limits
Stop	ST		
Set Position	CPxxx.x (x = 000.0--999.9)	CP180.0	Sets the current position to the specified value
Read Position	CP?		Queries the current position in degrees
Move CW	CW		Move clockwise
Move CC	CC		Move counter clockwise
Set CW Limit	ULxxx.x (x = 000.0--999.9	UL 359.9	Sets upper limit in non-continuous mode.
Query CW Limit	UL?		Returns CW limit

Command	Format	Example	Description
Set CC Limit	LLxxx.x (x = 000.0–999.9)	LL000.0	Sets CC limit in non-continuous mode.
Query CC Limit	LL?		Returns CC limit
Query Motion Direction	DIR?		Reports motion direction: CW, CC or N (no motion)
Seek	SKxxx.x (x=000.0—999.9)	SK180.0	Seeks specified target in degrees

A carriage return (0x0D) must be sent at the end of every command. An acknowledge byte (0x06) is returned after all non-query commands.

WARNING

Ensure the current travel limit settings will not cause damage to existing cables.

WARNING

Do not operate the AP in a stalled condition. Doing so can cause damage to the drive unit and will void the warranty. Ensure the positioner will continue to rotate under load at all speeds.

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Appendix A: Warranty

See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your Model 2005 Azimuth Positioner and LMF-3995 RS-232 RFI/EMI Filter.

DURATION OF WARRANTIES FOR MODEL 2005 AZIMUTH POSITIONER AND LMF-3995 RS-232 RFI/EMI FILTER

All product warranties, except the warranty of title, and all remedies for warranty failures are limited to the duration specified in the table.

Product Warranted	Duration of Warranty Period
Model 2005 Azimuth Positioner	2 Years
LMF-3995 RS-232 RFI/EMI Filter	1 Year

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